OCCASIONAL PAPERS OF THE
FARLOW HERBARIUM OF CRYPTOGAMIC BOTANY

HARVARD UNIVERSITY, CAMBRIDGE, MASSACHUSETTS

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Stereocaulon arenarium (Sav.) M. Lamb, a Hitherto Overlooked Boreal-Arctic Lichen

I. Mackenzie Lamb

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No. 1. Sylvia A. Earle: *Hummbrella,* a New Red Alga of Uncertain Taxonomic Position from the Juan Fernandez Islands (June 1969).

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STEREOCAULON ARENARIUM (SAV.) M. LAMB, A HITHERTO OVERLOOKED BOREAL-ARCTIC LICHEN

I. MACKENZIE LAMB
FARLOW HERBARIUM, HARVARD UNIVERSITY
CAMBRIDGE, MASSACHUSETTS 02138

Summary

Stereocaulon arenarium, originally described as a form of *St. denudatum* from Kamtchatka, proves to be a distinct species, similar in its morphology and ecology to *St. arcticum* Lynge, but chemically different (porphyrilic acid instead of stictic acid). Characteristic of the tundra zone, it has apparently a more restricted boreal-arctic distribution than *St. arcticum*.

Introduction

Dr. V. P. Savicz, in a paper on the *Stereocaula* of Kamtchatka published in 1923, recognized for the first time five taxa which have subsequently proved to be good distinct species:

St. coralloides f. *intermedium* Sav. (syn. *Stereocaulon intermedium* (Sav.) H. Magn., 1926)

St. tomentosum f. *glareosum* Sav. (syn. *Stereocaulon glareosum* (Sav.) H. Magn., 1926)

St. evolutum f. *sterile* Sav. (syn. *Stereocaulon sterile* (Sav.) M. Lamb, **n. comb.**)[1]

St. alpinum f. *pulvinarium* Sav. (now found by the present author to be a synonym of *Stereocaulon rivulorum* H. Magn.)

St. denudatum var. *pulvinatum* f. *arenarium* Sav. (syn. *Stereocaulon arenarium* (Sav.) M. Lamb, **n. comb.**)[2]

The present paper deals with the last-mentioned of these; *St. sterile* (Sav.) M. Lamb will be dealt with in a subsequent communication.

Stereocaulon arenarium (Sav.) M. Lamb, **n. comb.**

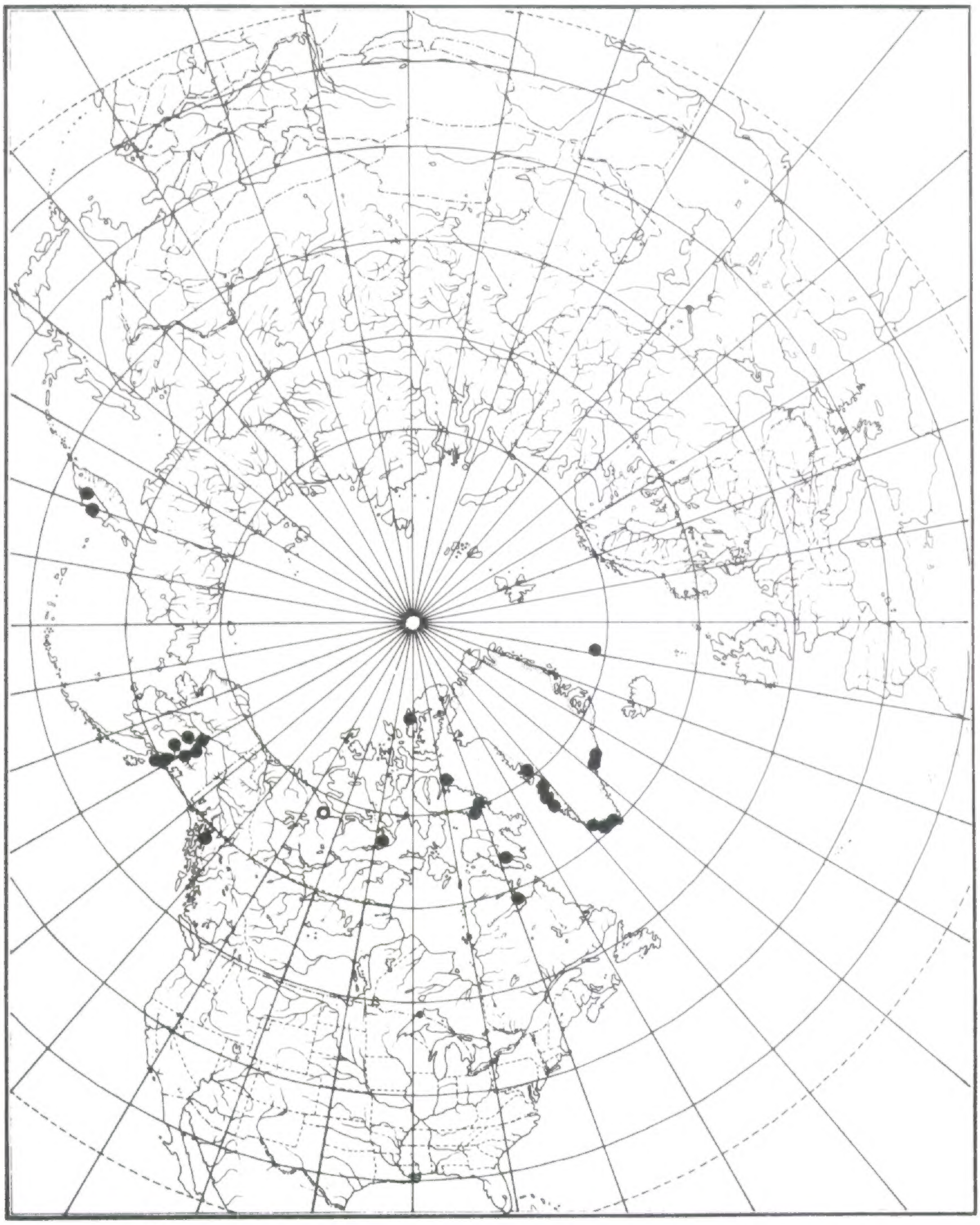
Syn. *St. denudatum* var. *pulvinatum* f. *arenarium* Savicz, 1923, p. 171.
Lectotype material: U.S.S.R., Kamtchatka, crater of Uzon Volcano south

[1] Direct basionym reference: *Stereocaulon evolutum* f. *sterile* Savicz in Bot. Materialy, Notul. System. ex Inst. Cryptog. Hort. Bot. Petropol. 2 (11), p. 165. 1923.

[2] Direct basionym reference: *Stereocaulon denudatum* var. *pulvinatum* f. *arenarium* Savicz in Bot. Materialy, Notul. System. ex Inst. Cryptog. Hort. Bot. Petropol. 2 (11), p. 171. 1923.

of Kronotski Lake, coll. V. P. Savicz, 1909 (no. 6419), in Herb. Bot. Inst. Acad. Sci. USSR, Leningrad (LE); duplicate in Herb. Inst. Syst. Bot. Univ. Uppsala (UPS).

A terricolous or muscicolous (rarely directly saxicolous) species belonging to subgen. *Stereocaulon,* sect. *Leucocheilon,* subsect. *Peltophyllum,* morphologically closely resembling *St. arcticum* Lynge or *St. vesuvianum* var. *depressum* (H. Magn.) M. Lamb, but chemically different, containing porphyrilic acid instead of stictic acid, hence react-



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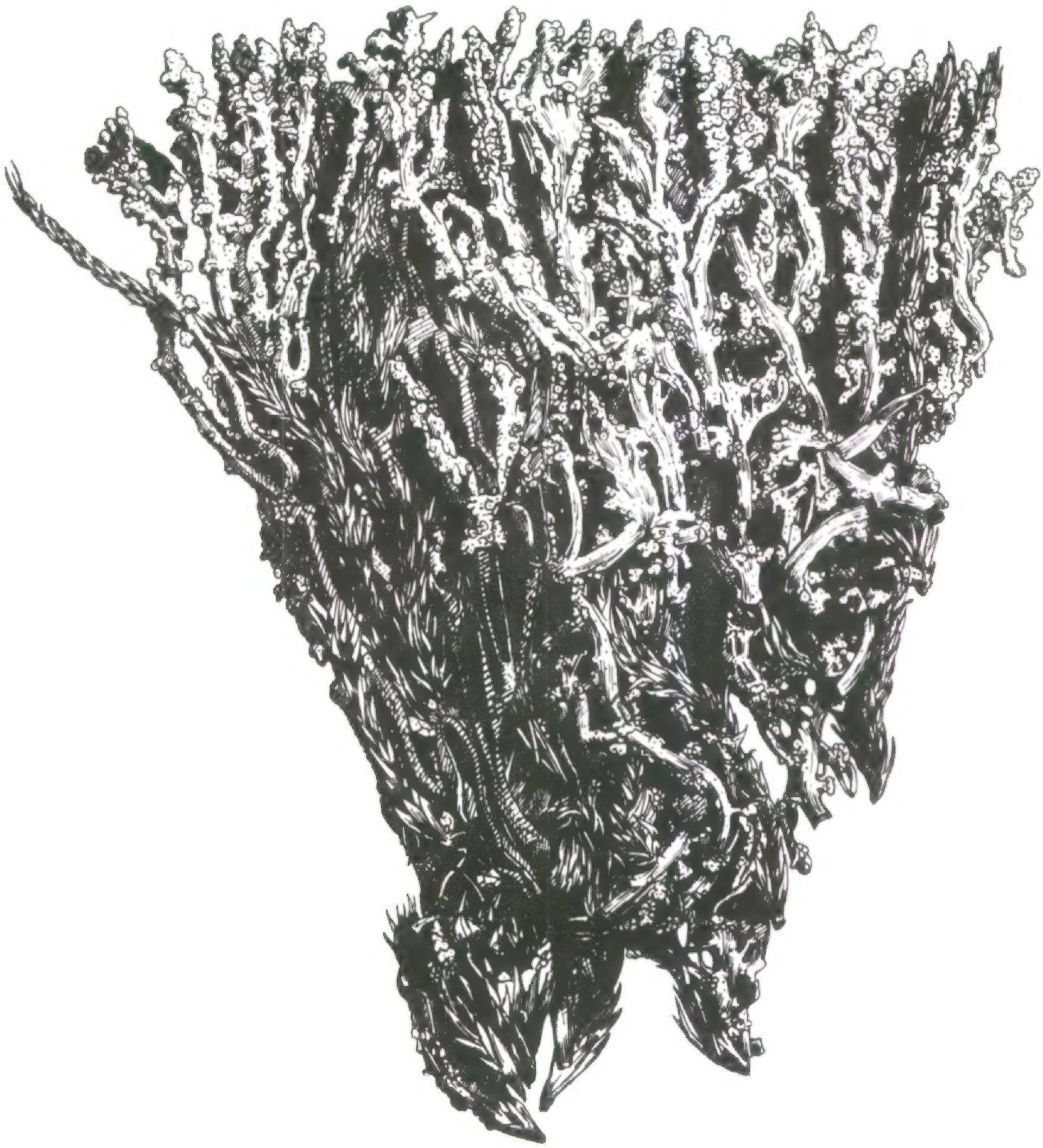
ing faint yellow (not red) with paraphenylenediamine (PD), and with a more restricted arctic-subarctic distribution (Fig. 1).

Figs. 2-6 (habitus).

Forming compact, subglobular or flattened-pulvinate clumps 1.5-3.0 (–9.0) cm diam. of densely caespitose, upright or decumbent pseudopodetia, loosely or ± firmly attached to substratum (usually detritus or mosses). *Pseudopodetia* 1-3 cm long, usually brownish, denuded and emorient below, above with an appressed, fibrous tomentum, 0.8-1.3 mm diam. (including the phyllocladial covering), subsimple or sparingly and irregularly branched, ± tapered or acuminate at tips. *Phyllocladial squamules* forming an almost continuous covering on the pseudopodetia, nodulose or verrucose to flattened-peltate, some or all with distinct darker (olive-glaucous or alutaceous) central portions or spots and ± tumid, paler (whitish) margins, occasionally somewhat coalescent to form compound squamules; nodulose phyllocladia 0.2-0.6 mm diam., flattened-peltate phyllocladia up to 0.8 (–1.0) mm diam. No *soredia*. *Cephalodia* scarce to frequent, occasionally absent, lateral on pseudopodetia between the phyllocladia, pale to dark brown or subaeruginose, pulvinate-verrucose, 0.3-1.0 (–2.0) mm diam., with indistinctly verruculose or subbotryose surface, containing *Nostoc* or *Stigonema*. *Apothecia* rarely present, laterally sessile on pseudopodetia, small, lecideine, blackish, 0.5-1.0 mm diam., scutelliform with thin dark margin, finally slightly convex and immarginate. Excipulum developed at sides only, 30-60 μ thick, pale brown in section, of conglutinated, thick-walled, ± parallel hyphae. Central cone colorless to faintly sordid brownish, compact, of gelatinously confluent, thick-walled hyphae, up to 150 μ deep. Hypothecium 30-70 μ deep, pale brownish. Hymenium 50-60 μ high, reddish-brown in upper part. Paraphyses simple or once-branched, 1.0-1.5 μ thick, clubbed to 3 μ at the pigmented tips. Asci ca. 45 μ long. (No ripe spores seen.)

Characteristically a species of the boreal montane zone and subarctic tundra, growing on alluvial plains and in moss and *Dryas* heaths, either in moss hummocks or on naked gravelly soil. It may form in places extensive continuous communities; Dr. Mason Hale in 1950 found such a community on Baffin Island which measured about 23 m in length and 3 m in breadth. It displays a range of morphological variation closely comparable to that of *St. arcticum* Lynge (the commonest and best developed state) and *St. vesuvianum* Pers. var. *depressum* (H. Magn.) M. Lamb and f. *umbonatum* (Wallr.) M. Lamb (more densely pulvinate and compacted states). It is very seldom fertile. It can be readily distinguished by the faint yellow reaction with paraphenylenediamine from *St. arcticum* and *St. vesuvianum,* which are always PD + orange-red. Thin layer chromatography was carried out on most of the available



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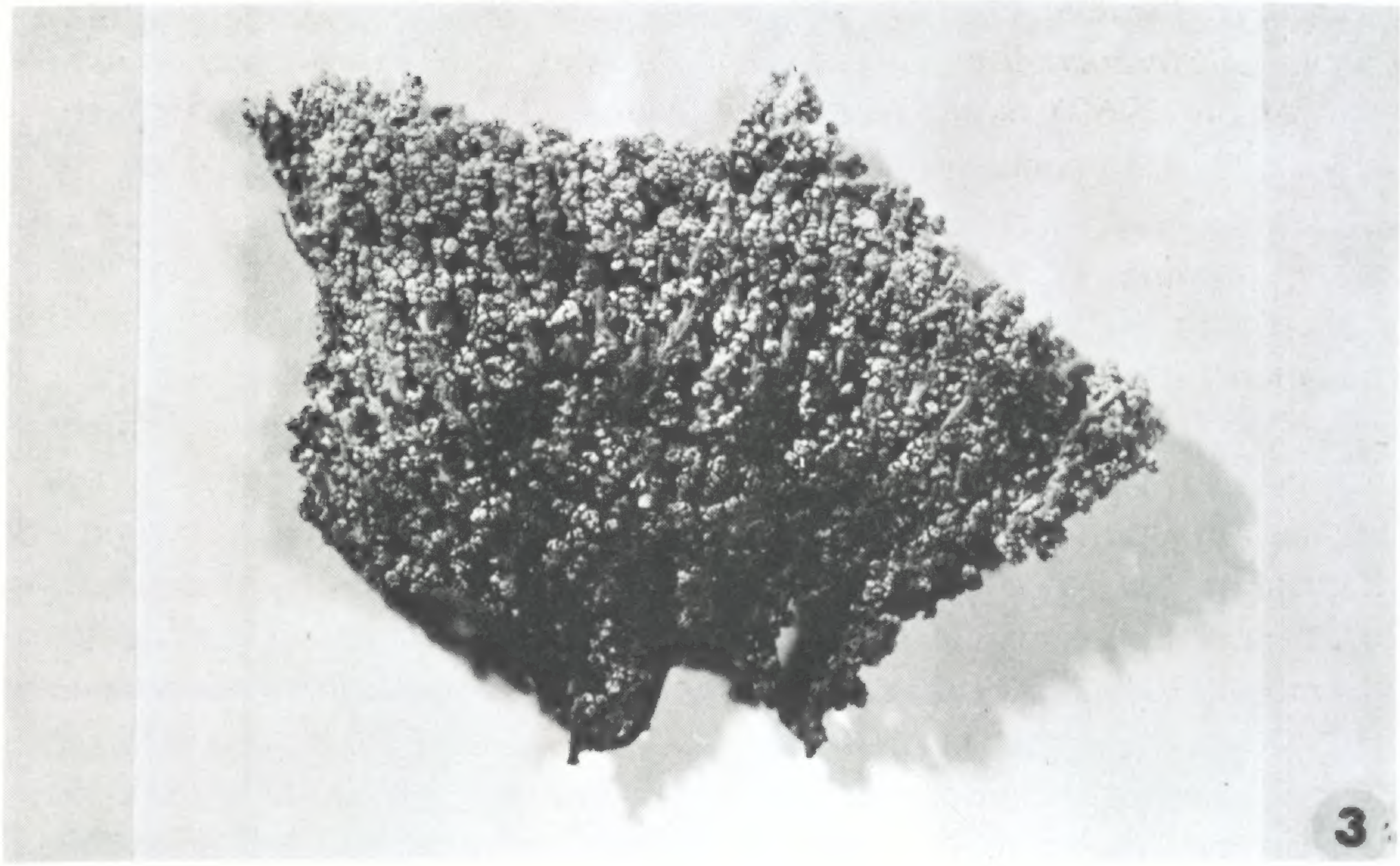
specimens, and invariably showed porphyrilic acid (dendroidin) and atranorin. The statement by the present author (Lamb, 1951, p. 557) concerning the occurrence of "dendroidin" in "*Stereocaulon vesuvianum* var. *umbonatum* Ch. str. III" actually refers to the present species.

An account of the dibenzofuran compound porphyrilic acid, demonstrating its identity with dendroidin, was given by Fox, Maass & Lamb (1969). In thin layer chromatograms it forms a spot close to the point of origin (RF value nearly zero) which gives a greenish coloration with ferric chloride. A simple method to demonstrate this characteristic greenish spot on Eastman Chromatogram Sheet is to use as solvent hexane: ethyl acetate: formic acid 100: 20: 1 and spray with ferric chloride dissolved in 95% alcohol. Other microcrystallographic and chromatographic methods for the recognition of porphyrilic acid are



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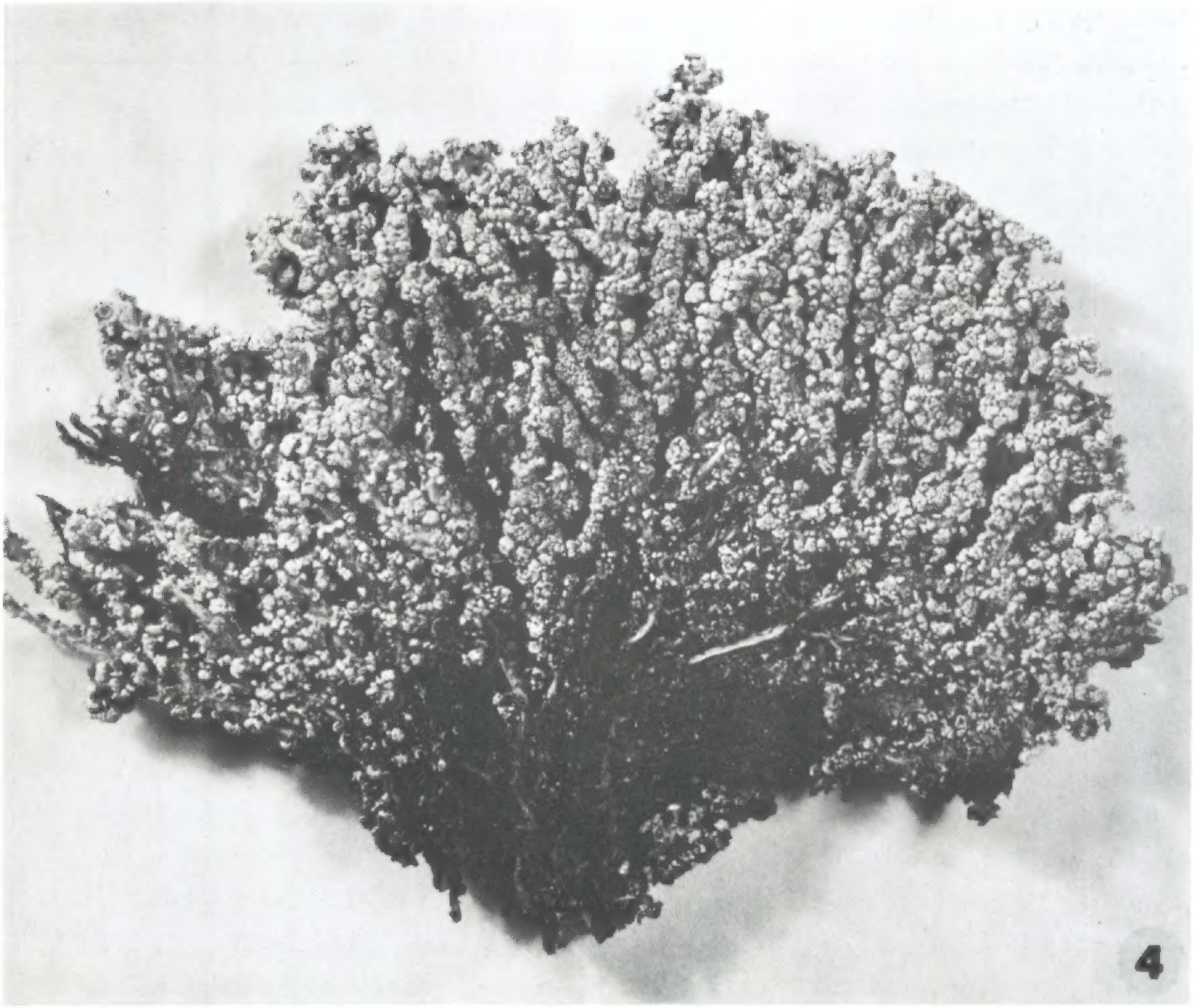

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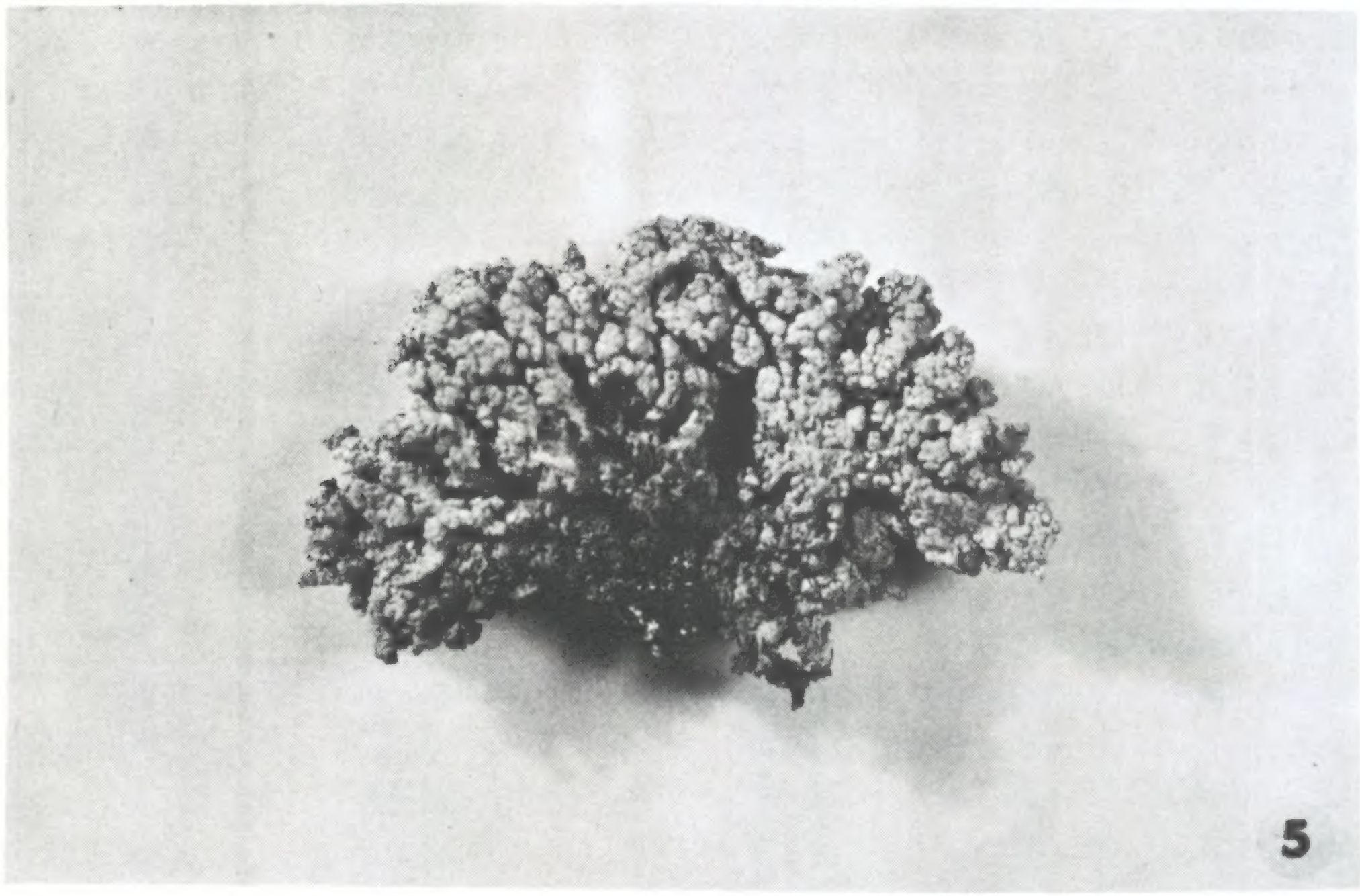
given by Asahina (1970). Porphyrilic acid occurs in several other species of *Stereocaulon* (Fox, Maass & Lamb, 1969), in *Haematomma* (Culberson, 1969), some of the red-fruited *Cladonia* species (Asahina, 1970, 1971), in some species of *Siphula* (Santesson, 1967), and in one species of *Lecidea* (Huneck, 1966).

Stereocaulon denudatum var. *pulvinatum* f. *arenarium* Savicz, described with a short diagnosis from Kamtchatka on the basis of several specimens, has been lectotypified by the present author on one of these which is known to contain porphyrilic acid, and hence the epithet *arenarium* is available in new combination for the present species. It is not certain whether all of the specimens cited by Savicz in the original description belong here; some of them may be referable to *St. arcticum* or *St. vesuvianum* var. *depressum*. The statement by the present author (Lamb, 1970, p. 223) that *St. denudatum* var. *pulvinatum* f. *arenarium* Sav. is synonymous with *St. arcticum* Lynge, is, as a consequence of the present lectotypification, erroneous. Thomson (1970) has recorded "*Stereocaulon vesuvianum* var. *umbonatum*" from arctic Canada, N. W. Territories, near Coppermine, with the statement that the specimen contained atranorin, lobaric acid and porphyrilic acid (dendroidin), as determined by crystal tests; this record appears to refer to *St. arenarium*, although the statement of the occurrence of lobaric acid as additional substance is discrepant with our findings for this species.

The distribution pattern of *St. arenarium* is probably circumpolar, although at present no specimens have been seen from the European sector of the Arctic or from arctic or subarctic Siberia, with the exception of Kamtchatka. (The record of "*Stereocaulon denudatum* f. *arenarium*" from Lake Baikal by Rassadina, 1936, p. 644, is of uncertain application.) Its range, as known at present, includes Greenland, Jan Mayen, northern Canada, Alaska and Kamtchatka (Fig. 1), thus overlapping with, but more restricted than, that of its morphological counterparts *St. arcticum* and *St. vesuvianum*.

Canada. North West Territories, North Franklin Distr., Axel Heiberg Island, White Glacier, head of Expedition Fjord, on soil, M. Kuc 1968 no. L 69 (CAN, FH), ster.; East Franklin Distr., Bylot Island, on exposed old beach levels, W. H. Drury 1954 no. 5439 pr. p. (FH), ster.; South East Franklin Distr., Baffin Island, head of Clyde Fjord, "in moss hummocks, tightly packed", "on barren sand outwash plain, on less exposed slopes, forming hemispherical colonies", M. E. Hale 1950 no. 228, 262 (US, FH), ster.; Baffin Island, Frobisher Bay, "in moss heaths", M. E. Hale 1950 no. 662 (US, FH), ster.; on granite boulders, "common", J. A. Calder 1948 no. 2039 (MICH, FH), fert.; central Baffin Island, B. Bradley without date no. 5 (CAN), ster.; Keewatin Distr., Parsons Lake, near E. side of Chantry Inlet, J. W.



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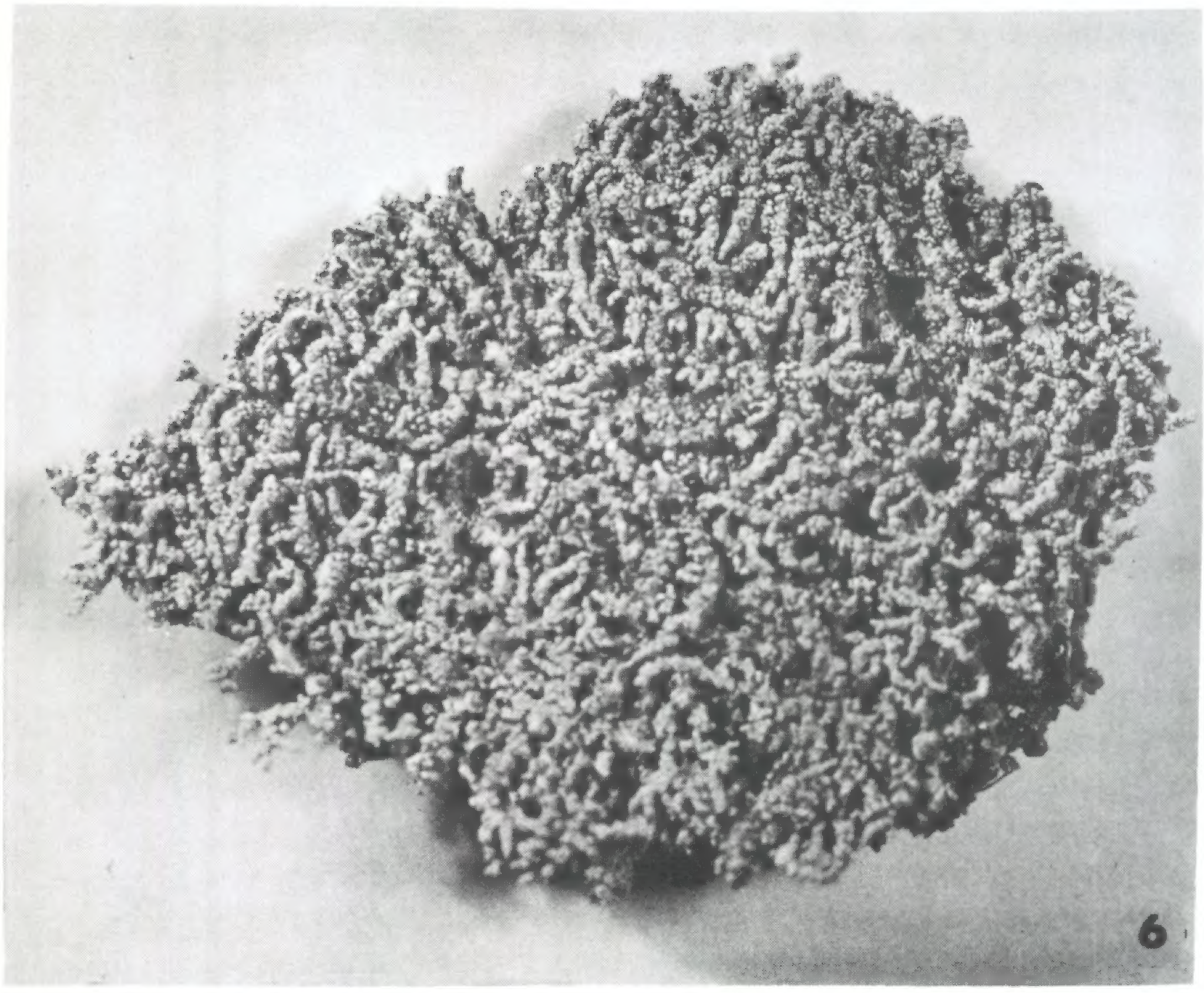

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Thomson & J. A. Larsen 1959 no. 5857 (WIS), ster.; (? North Mackenzie Distr., near Coppermine, J. W. Thomson 1962 no. 12706, recorded by Thomson, 1970, p. 159 as "*Stereocaulon vesuvianum* var. *umbonatum*", not seen by present author but probably *St. arenarium;* locality indicated by open circle on Fig. 1); Québec, Nouveau Québec Distr., Ungava Bay, 100 miles up Leaf River, J. C. Marr 1948 no. 142 pr. p. (WIS, FH), ster.

U.S.A., Alaska. Central Pacific Coast Distr., Kenai Peninsula, Quartz Creek, on shallow slaty soil, H. J. Lutz 1949 no. 520a (CAN), ster.; Marathon Mountain, altit. ca. 1000 m, H. Krog 1957 no. 1735 (O, FH), ster.; Talkeetna Mts., Government Peak, altit. ca. 1450 m, H. Krog 1957 no. 1119 (O, FH), ster.; Anchorage area, Eagle River, altit. ca. 1000 m, H. Krog 1953 no. 220 (O, FH), ster.; Eastern Pacific Coast Distr., nunataks of Juneau Icefield, altit. ca. 1200 m, D. Patter & M. McCaul 1962 no. 59 (McCullough), ster.; Alaska Range Distr., Mt. McKinley Nat. Park, Mt. Eielson (Copper Mountain), altit. ca. 1000-1600 m, "on moist tundra of fell field knife edge ridge", W. A. Weber & L. A. Viereck 1956 no. S.7165 (COLO, FH), ster.; Denali Highway, Mile 28, altit. 1000-1400 m, H. Krog 1957 no. 3310 (O), ster.; altit. 1600-1800 m, H. Krog 1957 no. 3313 (O, FH), ster.; Central Yukon River Distr., White Mts., Lion Peak, altit. ca. 900-1050 m, H. Krog 1953 no. 334 (O, FH), ster.

U.S.S.R., Kamtchatka. Uzon Volcano crater S. of Kronotski Lake, V. P. Savicz 1909 no. 6419 (LECTOTYPUS) (LE, UPS), ster.; valley of Gremuchaya River, Mt. Kokten near Koryatski Volcano, V. P. Savicz 1908 sine numero (MSK, FH), ster.

Jan Mayen. Tornoibekken, J. Lid 1930 sine numero (UPS), ster.

Greenland. South-East Greenland, Sermiligarssuk, K. Hansen 1965 sine numero (C, FH), ster.; Sermilik, K. Hansen 1962 sine numero (C, FH), ster.; Angmagssalik area, Nagtivit, Tasilalik, "on silt loam in open heath", F. J. A. Daniëls 1968 no. D.1020 (U), ster.; Qingertivaq, foot of Cassiopefjeld, "in open snowbed vegetation on coarse sand", H. Ferwerda 1969 no. D.1042 (U), ster.; Kulusuk, Kap Dan, "on coarse sand and gravel with *Salix herbacea*", F. J. A. Daniëls 1968 no. D.1016, D.1031 (U), ster.; South-West Greenland, Sukkertoppen Distr., Kangerdluarssuk, K. Hansen 1962 sine numero (C, FH), ster.; Søndre Strømfjord, Ata Pa, "on rocks", M. Skytte Christiansen 1946 no. 91 (C, FH), fert.; Nakajanga Umivit, "on loess covering rocks along the sea shore", M. Skytte Christiansen 1946 no. 250 (C, FH), ster.; Mt. Hassell, "on loess soil in open *Dryas* heath", "on crumbling mica schist", M. Skytte Christiansen 1946 no. 247 (C, FH), fert., no. 248, 253 (C, FH), ster.; Itivdlinguaq, "on a thin layer of loess covering rocks", M. Skytte Christiansen 1946 no. 246 (C, FH),

ster.; Borgshavn, Sanerut, E. Dahl 1937 sine numero (US), ster.; unnamed lake in lat. 61°43′ N., long. 48°08′ W., K. Hansen 1965 sine numero (C, FH), ster.; Frederikshaab Distr., Ivigtut, Guldfjeldet, "on open, very exposed, gravelly soil", M. Skytte Christiansen 1946 no. 260 (C, FH), ster.; Nigerdlikasik, K. Hansen 1965 sine numero (C, FH), ster.; Igaliko Fjord, Iterdlaq, K. Hansen 1962 sine numero (C, FH), ster.; West Greenland, Christianshaab, Sarpiussât, Timâ, "part of large tufted individual, between moss on humus-clad, coarse gravel", P. Gelting 1952 no. 19180 (C), ster.; Godhavn Distr., W. Disko, Nordfjord, Kugsinersuaq Delta, in dry river bed, P. Gelting 1950 no. 13711 (C), ster.; W. Disko, Mellemfjord, "on gravelly soil at a brook", P. Gelting 1949 no. 11271 (C, FH), ster.; W. Disko, N. Laksebugt, on gravel plain, P. Gelting 1949 no. 11269 (C, FH), ster.; Egedesminde, Arfersiorfik Fjord, Tarajornitsoq, about sea level, "forming semiglobular tufts on naked gravelly soil", P. Gelting 1951 no. 16444 (C, FH), ster.; Kuánit, "among mosses on gneissic rocks", P. Gelting 1951 no. 16401 (C), ster.

The last-mentioned specimen from Greenland (Gelting no. 16401) was infested by a parasymbiontic fungus ("lichen parasite") determined by Dr. R. Santesson in 1960 as *Polycoccum trypethelioides* (Th. Fr.) R. Sant.

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National Museum of Canada, Ottawa, Canada (CAN).
University of Colorado Museum, Boulder, Colorado, U.S.A. (COLO).
Botanical Institute of the Academy of Sciences of the USSR, Leningrad, U.S.S.R. (LE).
University of Michigan Herbarium, Ann Arbor, Michigan, U.S.A. (MICH).
Biological Institute of the Academy of Sciences of the Byelorussian SSR, Minsk, U.S.S.R. (MSK).
Botanical Museum, Oslo, Norway (O).
Botanical Museum, Utrecht, Netherlands (U).

Institute of Systematic Botany, Uppsala, Sweden (UPS).
Smithsonian Institution, U. S. National Museum, Washington, D.C., U.S.A. (US).
University of Wisconsin Herbarium, Madison, Wisconsin, U.S.A. (WIS).
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The drawing for Fig. 2 was prepared by Mr. Kenny Smith-Brunet.

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Explanation of Figures

Fig. 1. Known distribution of *Stereocaulon arenarium* (Sav.) M. Lamb. (Solid dots represent material seen by the author; open circle represents a literary record probably referable to this species.)

Fig. 2. Part of a specimen from Canada, Baffin Island, Clyde Fjord, coll. M. E. Hale, 1950 (no. 228). x 3.

Fig. 3. Specimen from W. Greenland, Egedesminde, Tarajornitsoq, coll. P. Gelting, 1951 (no. 16444). x 2.

Fig. 4. Specimen from Canada, Baffin Island, Frobisher Bay, coll. M. E. Hale, 1950 (no. 662). x 2.

Fig. 5. Specimen from U.S.A., Alaska, Mt. McKinley Nat. Park, Mt. Eielson, coll. W. A. Weber & L. A. Viereck, 1956 (no. S.7165). x 2.

Fig. 6. Specimen from U.S.A., Alaska, Kenai Peninsula, Quartz Creek, coll. H. J. Lutz, 1949 (no. 520a). x 2.